

CLAIMS

What is claimed is:

1. A method of fabricating an interconnect structure in an integrated circuit comprising:
 - forming an etch stop/diffusion barrier over an underlying layer;
 - depositing an interlayer dielectric on the etch stop/diffusion barrier;
 - etching vias and trenches in the interlayer dielectric;
 - treating the surface of the interlayer dielectric with plasma, so as to deposit a coating of carbon-rich polymeric material;
 - depositing a barrier layer over the surface of the treated interlayer dielectric, so as to line the vias and the trenches;
 - forming a copper alloy over the barrier layer, so as to fill the vias and the trenches; and
 - planarizing the copper alloy.
2. The method of claim 1, wherein hydrocarbon plasma treatment is used to treat the surface of the interlayer dielectric.
3. The method of claim 2, wherein the barrier layer is comprised of tantalum.
4. The method of claim 2, wherein the plasma treatment utilizes C₂H₄ plasma.
5. The method of claim 3, wherein the plasma treatment utilizes C₂H₄ plasma.

6. The method of claim 3, wherein the tantalum is deposited by physical vapor deposition.
7. The method of claim 5, wherein the tantalum is deposited by physical vapor deposition.
8. The method of claim 7, wherein less than 30nm of tantalum is deposited over the interlayer dielectric.
9. The method of claim 1, wherein the barrier layer is comprised of tantalum.
10. The method of claim 9, wherein the tantalum is deposited using physical vapor deposition (PVD).
11. The method of claim 10, wherein less than 30nm of tantalum is deposited over the interlayer dielectric.
12. The method of claim 1, wherein the barrier layer is comprised of tantalum nitride.
13. The method of claim 12, wherein less than 30nm of tantalum nitride is deposited over the interlayer dielectric.

14. A method of treating porous dielectric materials comprising:

treating the surface of a porous dielectric material with hydrocarbon plasma, so as to deposit a carbon-rich polymer material on the surface of the porous dielectric material;
and

depositing a barrier material over the carbon-rich polymer material, so as to line the vias and the trenches.

15. The method of claim 14, wherein the barrier material is comprised of tantalum.

16. The method of claim 14, wherein the barrier material is comprised of tantalum nitride.

17. The method of claim 14, wherein the hydrocarbon plasma is comprised of C_2H_4 .

18. The method of claim 14, wherein the porous dielectric material is polymer material.

19. The method of claim 14, wherein the porous dielectric material is a non-organic material.

20. An interconnect structure comprising:

vias and trenches defined by an interlayer dielectric disposed above an underlying layer;

a carbon rich polymer layer is disposed on the surface of the interlayer dielectric, so as to line the vias and the trenches;

a barrier layer disposed over the carbide layer; and

a copper alloy over the barrier layer, filling the vias and the trenches.

21. The interconnect structure of claim 20, wherein the barrier material is comprised of tantalum.

22. The interconnect structure of claim 20, wherein the barrier material is comprised of tantalum nitride.

23. The interconnect structure of claim 20, wherein the carbon rich polymer layer is an interfacial carbide layer.

24. The interconnect structure of claim 20, wherein the interlayer dielectric is a polymer layer.

25. The interconnect structure of claim 20, wherein the interlayer dielectric is a non-organic layer.

26. The interconnect structure of claim 20, wherein the structure is repeated for multi-layered structures.